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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/699,137	10/30/2003	Wendy Ng	A5701D1/T41510	3462

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Patent Counsel, M/S 2061
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EXAMINER

HASSANZADEH, PARVIZ

ART UNIT PAPER NUMBER

1763

DATE MAILED: 09/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/699,137	NG ET AL.	
	Examiner	Art Unit	
	Parviz Hassanzadeh	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 October 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 6-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 6-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 6-9, 12, 13, 16 are rejected under 35 U.S.C. 102(b) as being anticipated by Sivaramakrishnan et al (US Patent No. 5,879,574).

Sivaramakrishnan et al teach a processing chamber (Fig. 17C) for a plasma-based semiconductor fabrication process and a method of using the same employing an endpoint detection device arranged in an exhaust line of the processing chamber, the method comprising:

Providing a *processing chamber* 15 for performing a deposition or etching process on a wafer supported on a support member 25, wherein the process chamber is configured to receive plasma species from a remote plasma source 55 after the wafer is removed from the process chamber, and wherein the processing chamber includes an isolation valve (*throttle valve*) 371 configured to output an exhaust from the processing chamber;

Providing a *bypass line* 804 positioned downstream from the throttle valve 371, the bypass line 804 including a *control valve (isolation valve)* 806 to vary the amount of flow passing through line 804 or to completely cease gas flow along the bypass line 804, for example, during gas processing of the wafer within the chamber; and

Providing a detector (*endpoint detection cell*) 802, the endpoint detection cell positioned downstream from the isolation valve 806 and selectively isolated from exposure to chamber

exhaust by the isolation valve (column 38, line 5 through column 39, line 20), wherein the detector output is communicated with a process controller 50 which control the entire operation of the system including wafer transfer, deposition or etching, and finally cleaning of the chamber (column 14, lines 40-65).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 10, 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sivaramakrishnan et al (US Patent No. 5,879,574) in view of Moran (US Patent No. 5,986,747).

Sivaramakrishnan et al teach all limitations of the claims as discussed above except for end point detector comprising a cathode, an anode, and an optical detector, the optical detector detecting an optical signal resulting from an electrical discharge between the cathode and the anode.

Moran teaches an analysis chamber 422 (*endpoint detection cell*) as shown in Fig. 4. comprising an excitation source 429 such as a cathode 131B and an anode 131A (Fig. 1) and an optical analyzer 438, wherein the excitation source 429 and the optical analyzer 438 are in communication with a system controller, and wherein the analysis chamber 422 is in communication with an exhaust line 405 via a sampling valve 426 (column 5, line 55 through column 6, line 12 and column 3, lines 43-62).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to utilize the end point detection mechanism as taught by Moran in the apparatus of Sivaramakrishnan et al as an art recognized equivalent for the same purpose of monitoring endpoint of a process in the exhaust line of a process chamber. See MPEP 2144.06, Art Recognized Equivalent for the Same Purpose, Substituting Equivalents Known for the Same Purpose (in re Fout, 675 F.2d 297, 213 USPQ 532 (CCPA 1982)).

Claims 11, 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sivaramakrishnan et al (US Patent No. 5,879,574) in view of Moran (US Patent No. 5,986,747) as applied to claims 10 and 14 above, and further in view of Williams et al (US Patent No. 5,472,561).

Sivaramakrishnan et al in view of Moran teach all limitations of the claims as discussed above except for the endpoint detection cell including an RF power detector detecting an RF power of a plasma generated in the endpoint detection cell.

Williams et al teaches a plasma reactor 14 (Fig. 1) including a sensor 13 for monitoring voltage, current and phase angle of an RF signal coupled to the plasma reactor in order to control the plasma condition (abstract and column 3, lines 1-45).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the RF power detection mechanism as taught by Williams et al in the apparatus of Sivaramakrishnan et al in view of Moran in order to monitor and control the condition of plasma in the detection cell.

Claims 6-10, 12-14, 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nonaka (JP 5-326457-A) in view of Moran (US Patent No. 5,986,747).

Nonaka teaches a processing chamber (Fig. 1) for a plasma-based semiconductor fabrication process and a method of using the same employing an endpoint detection device arranged in an exhaust line of the processing chamber, the method comprising:

Providing a *processing chamber 1* configured to receive plasma species from a plasma source, the processing chamber including a *throttle valve 6* configured to output an exhaust from the processing chamber;

Providing a *bypass foreline 7* positioned downstream from the throttle valve 6; and

Providing an *endpoint detection cell 8* (abstract).

Nonaka fails to teach the bypass foreline including an *isolation valve* such that the endpoint detection cell positioned downstream from the isolation valve and selectively isolated from exposure to chamber exhaust by the isolation valve.

Moran teach an analysis chamber 422 (*endpoint detection cell*) arranged in an exhaust line 405 of a processing chamber 402 wherein the analysis chamber 422 (*endpoint detection cell*) is isolated form the exhaust line by a valve 426 for sampling process byproducts. The analysis chamber 422 (*endpoint detection cell*) comprising an excitation source 429 such as a cathode 131B and an anode 131A (Fig. 1) and an optical analyzer 438, wherein the valve 426, the

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excitation source 429 and the optical analyzer 438 are in communication with a system controller (column 5, line 55 through column 6, line 12 and column 3, lines 43-62).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the endpoint detection mechanism as taught by Moran in the apparatus of Nonaka in order to sample the processing byproducts for analysis and thus separate the excitation required for analysis from fabrication process in the processing chamber, thereby reducing unwanted signals and improving the signal to noise ratio for the signals being analyzed (column 6, lines 29-36).

Furthermore : Moran further teaches that the analysis chamber 422 (*endpoint detection cell*) comprising an excitation source 429 such as a cathode 131B and an anode 131A (Fig. 1) and an optical analyzer 438, wherein the valve 426, the excitation source 429 and the optical analyzer 438 are in communication with a system controller (column 5, line 55 through column 6, line 12 and column 3, lines 43-62).

Furthermore: the apparatus of Nonaka or Moran can be used as plasma enhanced chemical vapor deposition processing (column 2, lines 50-56-60 of Moran).

Claims 11, 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nonaka (JP 5-326457-A) in view of Moran (US Patent No. 5,986,747) as applied to claims 6, 13 above, and further in view of Williams et al (US Patent No. 5,472,561).

Nonaka in view of Moran teach all limitations of the claim as discussed above except for the endpoint detection cell including an RF power detector detecting an RF power of a plasma generated in the endpoint detection cell.

Williams et al teaches a plasma reactor 14 (Fig. 1) including a sensor 13 for monitoring voltage, current and phase angle of an RF signal coupled to the plasma reactor in order to control the plasma condition (abstract and column 3, lines 1-45).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the RF power detection mechanism as taught by Williams et al in the apparatus of Nonaka in view of Moran in order to monitor and control the condition of plasma in the detection cell.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Nowak et al (US Patent No. 6,366,346 B1) teaches an endpoint detection cell disposed on an exhaust line wherein the effluent is excited and the emission is detected;

Cho et al (US Patent No. 6,146,492) teaches a monitoring system for analyzing the sampled portion from a processing chamber;

Kako et al (JP 9-213682-A) teaches an endpoint detection cell 3 and a selector valve 16 performing switching of reaction gas to the detection cell/exhaust side using a controller 7;

Koizumi (US Patent No. 6,136,387) teaches a conventional plasma reactor including a remote plasma chamber; and

Patick et al (US Patent No. 5,474,648) teach a plasma reactor including an RF parameter sensor.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Parviz Hassanzadeh whose telephone number is (571)272-1435. The examiner can normally be reached on Tuesday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (571)272-1439. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

P. Hassanzadeh

Parviz Hassanzadeh
Primary Examiner
Art Unit 1763

September 15, 2004